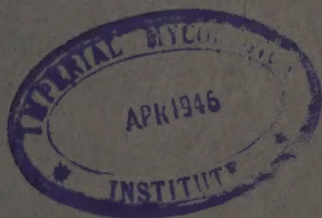


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SPHAEROBOLUS STELLATUS TODE.

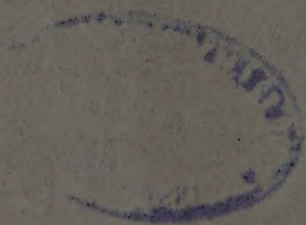
A Fungus with a Remarkable Method of
Spore-dissemination.

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SPHAEROBOLUS STELLATUS TODE.

A Fungus with a Remarkable Method of Spore-dissemination.

By G. H. CUNNINGHAM, Biological Laboratory, Wellington.

THIS species is a saprophyte, growing on dead wood, manure, old sacking, or on the ground. The fructifications are quite small, large forms seldom attaining a greater diameter than 2 mm. In structure they consist of a more or less globose peridium, arising from a mycelial web which covers the surface of the substratum. The nearly mature peridium is somewhat complex, consisting of (a) an outermost layer of loosely woven hyphal filaments undifferentiated from the mycelium covering the substratum (fig. 1, a); (b) a pseudoparenchyma of closely woven, partly gelatinized hyphae (fig. 1, b): these two layers collectively constitute the exoperidium, which encloses (c) a layer of hyphal filaments arranged in a more or less parallel manner (fig. 1, c); and (d) a layer of elongated cells arranged in columnar fashion, with their long axes at right angles to the surface of the peridium (fig. 1, d). These cells are rather large in size; they are closely compacted together, and form the endoperidium, surrounding a central cavity within which is situated the globose peridiolum* containing the gleba.

In structure the peridiolum consists of an outer pseudoparenchyma of closely woven, partly gelatinized hyphae, surrounding a central mass. At first this central mass consists of loosely woven hyphae, which later become somewhat compacted; then several cavities, separated by thin walls (trama), make their appearance. The inner surfaces of these cavities are lined with the hymenium, consisting of paraphyses and clavate basidia. The spores are sessile, sterigmata being absent, and range in number from four to seven on each basidium.

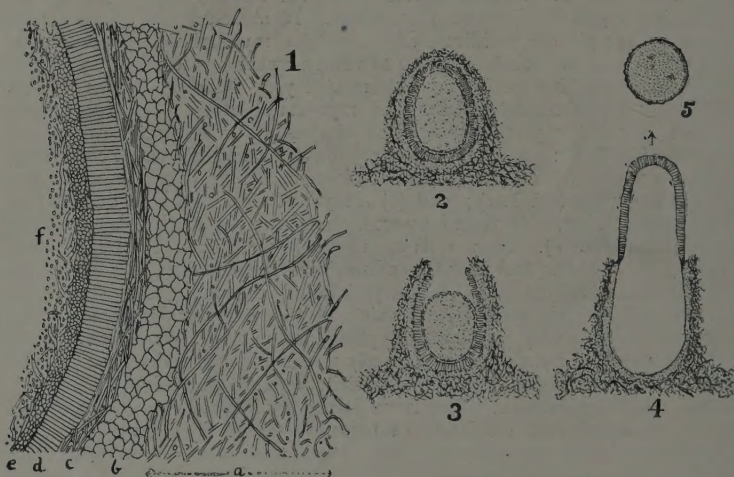
Finally the basidia and tramal walls become gelatinized, so that at maturity the central mass of the peridiolum consists entirely of spores embedded in a gelatinous matrix. A few peripheral hyphae do not become gelatinized, but are later converted into gemmae.

As the peridium approaches maturity it enlarges in size, and gradually grows through the enveloping layer of hyphae (fig. 1, a, and fig. 3) until the apex becomes exposed; this then splits in a stellate manner (by unequal pressure created by the continued growth of the apical portion of the endoperidium) and exposes the enclosed peridiolum. The endoperidium continues to develop until it separates from the exoperidium, rupture occurring along the layer of parallel filaments (fig. 1, c), which have at this stage become somewhat gelatinized. Suddenly the endoperidium becomes everted, and stands above the exoperidium (fig. 4), the peridiolum at the same time being thrust out and thrown to some little distance (fig. 5). The endoperidium does not become separated from the exoperidium when eversion occurs, but remains attached by the apices of the rays. The mature gleba is externally somewhat viscid, so that it readily adheres to any object with which it may come in contact.

* This structure is so generally termed the "peridiolum" that this name is retained here; structurally, it is quite different from the peridiola of the Nidulariales, and should therefore be distinguished by some other and more suitable term.

I have had this species growing on rotting sacking in the laboratory for several months; it is contained within a large flask, and the interior of the flask has in several places become covered with numerous peridiola which have adhered to the glass; in some instances these peridiola have been thrown to a distance of 100 mm. Generally, eversion of the endoperidium occurs suddenly; sometimes, however, the process is a gradual one, when the peridiolum is carried to the apex of the everted endoperidium, where it may remain or else fall to the ground.

Under favourable conditions the peridiolum quickly gives rise to a copious mycelium, which, according to Fischer (1884), arises as a result of the germination of the gemmae contained within the peridiolum, and



Sphaerobolus stellatus.

FIG. 1.—Section through the wall of the peridium; $\times 45$ diam. *a*, Outermost layer of loosely woven hyphal filaments; *b*, pseudoparenchyma of closely woven, partly gelatinized hyphae; *c*, hyphal filaments arranged in a parallel layer; *d*, elongated hyphal cells arranged in columnar fashion; *e*, wall of peridiolum showing the few hyphae which later become converted into gemmae; *f*, basidiospores embedded in the gelatinous matrix.

FIG. 2.—Mature peridium, immediately before dehiscence; $\times 8$.

FIG. 3.—Peridium splitting at apex; commencement of dehiscence; $\times 8$.

FIG. 4.—Peridium with everted endoperidium; end of dehiscence; $\times 8$.

FIG. 5.—Peridiolum ejected from peridium as the result of dehiscence; $\times 8$.

Camera-lucida drawings. Original.

not, as might be expected, from the basidiospores, which apparently germinate but rarely, and appear commonly to undergo gelatinization in a manner similar to the tramal walls.

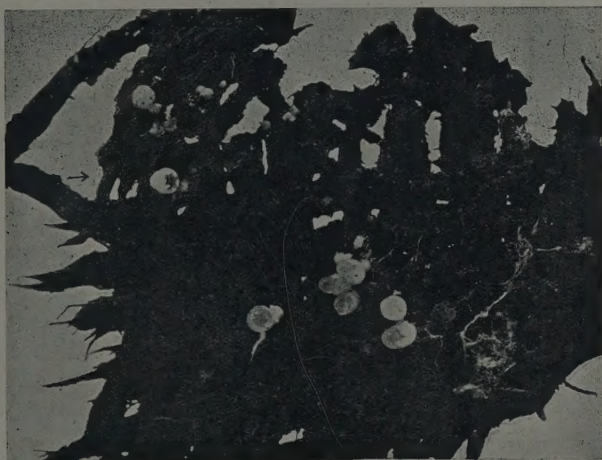
This genus was at one time included in the Nidulariaceae, as it was believed that the peridiolum was similar in structure to the peridiola of this family. Microscopic examination shows it to be quite distinct, however, as has been shown above; and because of this distinction, and the fact that the peridiolum is solitary within the peridium, Fischer (1900) placed it in the Sphaerobolaceae, a family he erected for the purpose. The family contains the single genus *Sphaerobolus*, which, according to

Fischer (1900), contains five species; but it appears to be doubtful whether more than one species is found in nature.

SPHAEROBOLUS TODE.

Tode, *Fung. Meckl.*, vol. 1, p. 43, 1790. *Ex Pers., Syn. Meth. Fung.*, p. 115, 1801. *Carpobolus* Mich., *Nov. Pl. Gen.*, p. 221, 1729.

Peridium sessile, on a mycelial weft, fleshy; consisting of a two-layered exoperidium, enclosing a somewhat thick endoperidium. *Peridiolum* solitary,



[E. Bruce Levy, photo.]

Sphaerobolus stellatus.

FIG. 6.—Peridia growing on decaying sacking, $\times 5$. At the top left hand are shown immature peridia; below is a peridium at stage of fig. 3 (see arrow); in the centre is a group of six peridia with everted endoperidia, the condition shown in text-fig. 4.

globose, at first enclosed within the endoperidium, becoming extruded by the sudden eversion of the endoperidium. *Basidiospores* hyaline, binucleate, enclosed within the peridiolum.

Distribution—World-wide.

The genus is characterized by the structure of the peridium, solitary peridiolum, and peculiar mode of dehiscence.

Sphaerobolus stellatus Tode, *l.c.*, p. 45. *Ex Pers., l.c.* (Figs. 1–6.)

Sphaerobolus tubulosus Fr., *Syst. Myc.*, vol. 2, p. 309, 1822. *S. stercorarius* Fr., *l.c.*, p. 310. *Carpobolus cyclophorus* Desm., *Rec. Trav. Soc. Lille*, p. 225, 1823. *Sphaerobolus cyclophorus* (Desm.) Fr., *Elench.*, vol. 2, p. 52, 1828. *S. impatiens* Boud. in Bisch. *Kryptogamen.*, t. 3644 (?), 1860. *Carpobolus stellatus* (With.) W. G. Sm., *Jour. Bot.*, p. 280, 1903.

Peridium sessile, at first embedded in the mycelial weft covering the substratum, becoming somewhat erumpent, subglobose, and up to 2 mm. diam., fleshy, externally hirsute and dingy-white, internally smooth and

orange. *Peridiolum* solitary, globose, reddish-brown, 0.75–1.25 mm. diam., lenticular when dry. *Basidiospores* hyaline, continuous, globose or obovate, $6-10 \times 5-8 \mu$; epispore smooth, 2μ thick, cell-contents granular.

Habitat.—Crowded on decaying wood and leaves, old sacking, manure, and on the ground.

Distribution.—World-wide. On rotting wood and sticks lying on the forest-floor, Ohau River, Wellington, 100 m., *E. H. Atkinson*, 12/9/19. On rotting sacking, decaying wood, and on the ground, Kelburn, Wellington, 125 m., *G. H. C.*, 27/6/22.

The plant varies considerably according to the substratum upon which it may happen to be growing; judging from the published descriptions, it would appear as if several species have been based on these variations. I have collected this species from various substrata, all within an area of one square metre, and although the external form differs somewhat according to the substratum, yet microscopic examination shows that in structural details all are identical.

LITERATURE CITED.

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—— *Sphaerobolaceae*, in Engler and Prantl, *Natuerliche Pflanzenfamilien*, 11th, p. 346, 1900.

